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ABSTRACT

A recurring question in the study of the specialized English used in various technical disciplines is the degree to which contextual variables--including subject matter--account for the particular distributions of lexicogrammatical features in texts of different disciplines. Two contextual variables related to role relationships in the semiotic structure of the situation are the specialization of the intended audience and the global text function or authorial purpose. One way to compare the impact of each of these variables on text structure is to examine the distributions of the lexicogrammatical features which realize the interpersonal component, e.g., person, disjunct adverbials, clause mood and modality, in texts where both of these variables have different values while all other contextual variables remain constant. Such was done with 16 written, monologic texts in recombinant DNA research. Within each text, a sample was taken of approximately 1,000 words and counted according to the lexicogrammatical features realizing the interpersonal component. An analysis of the findings reveals a lower degree of audience specialization correlates with a greater degree of interactiveness. Moreover, the lexicogrammatical features which realize the interactiveness tend to be distributed according to global text function; texts whose aims are to persuade or instruct their readers tend to be more interactive than texts which aim merely to narrate or inform. Overall, global text function appears to be a primary variable determining the distribution of the lexicogrammatical features of interactiveness, while specialization level of the intended audience appears to be a secondary variable. (HOD)

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FUNCTIONAL TYPES OF SCIENTIFIC PROSE

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This paper is a modified version of my 1982 University of Michigan dissertation completed under the direction of Professors Richard W. Bailey and Alton L. Becker

CS 207 211

Table of Contents

1. INTRODUCTION 1
1.1. Prior classifications based on tenor 2
2. INTERPERSONAL FUNCTIONS OF LEXICOGRAMMATICAL FEATURES 3
2.1. Person 3
2.2. Disjunct adverbials 4
2.3. Clause mood and modality 5
2.4. Other realizations of the interpersonal component 6
3. MEASURING THE IMPACT OF CONTEXTUAL VARIABLES ON LEXICOGRAMMATICAL FEATURES 7
3.1. Text selection and method of analysis 8
3.2. The impact of global text function 9
3.2.1. Presence of the reader 11
3.2.2. Presence of the writer 13
3.2.3. Summary findings 15
3.3. The impact of audience level 16
3.3.1. Presence of the reader 16
3.3.2. Presence of the writer 17
3.3.3. Summary findings 19
4. THE COMPARATIVE IMPACT OF TEXT FUNCTION AND AUDIENCE LEVEL 19
REFERENCES 23

1. INTRODUCTION

The study of the specialized English used in various technical disciplines has recently been of interest to applied linguists in Great Britain and the United States. A recurring question in that study has been the degree to which contextual variables--including subject matter--account for the particular distributions of lexicogrammatical features in texts of different disciplines. The question itself contains two questions: first, whether contextual variables have any significant impact on the realization of lexicogrammatical features of texts (and if so, how much); and second, which contextual variables are most important in determining the distributions of lexicogrammatical features. Assuming with Hasan 1978 that 'the correlation [between contextual variables and lexicogrammatical features] is causally determined, with certain contextual variables functioning as control...,' we can turn our attention to the second question, that of determining the relative impact of different variables. The answer that we give to this question is significant, for the ordering of contextual variables can serve as the basis for creating text genres, or, in the systemic-functional model, registers.

Most early studies of English registers, e.g. Halliday, McIntosh and Strevens 1964, Crystal and Davy 1969, seemed to classify English discourse primarily according to subject matter (or field), and recent pedagogical materials from Britain, e.g. Industrial English, English in Basic Medical Science, have apparently continued that classification scheme. But field is only one aspect of the semiotic structure of situation (the contextual variables controlling register). Tenor and mode--the other two aspects of the semiotic structure of situation--could equally well serve as the bases of discourse classifications. In this paper, we will be concerned with classifications based on tenor.

1.1. Prior classifications based on tenor

One early study, Sentence and Clause in Scientific English by Huddleston, Hudson, Winter, and Henrici, did attempt a comparison of texts on the basis of the participant relationships between the writers and readers of the texts (tenor). While limiting their selections of texts to subject matter in the sciences, Huddleston et al. classified their texts according to the level of background information demanded of the texts' readers. Texts were classified as either highly specialized, moderately specialized, or popular level. The distribution of particular lexicogrammatical features among the three classes of texts--for example, the percentage of passive voice constructions-- showed significant differences, thereby demonstrating the impact of tenor as a contextual variable influencing the realization of text structure.

However, level of audience specialization is not the only contextual variable operative in role relationships (tenor). Widdowson 1974 criticizes register-based classifications of texts for, among other things, ignoring the common rhetorical functions which cut across content (i.e. field) differences. The 'typical reader' of a technical text asked to describe what he reads will respond, according to Widdowson, that the text is a description, or a report, or a set of instructions, or an account of an experiment. These answers all refer to the global function of the text (i.e. to describe, to report, to instruct, to narrate) and, as such, refer to the purpose of the writer with respect to his audience. It therefore seems appropriate to include this variable as part of the tenor of the semiotic structure of situation and thus to use it as a basis on which to classify texts.

Of course, the resulting text genres are ones that are familiar to traditional rhetoric: descriptive, expository, procedural, and narrative. But what is different from traditional rhetoric is the attempt to relate these genres (global text functions or global authorial purposes) to particular distributions of lexicogrammatical features. Such an attempt has been made in

the tagmemic linguistic framework by Robert Longacre and others. Longacre 1976 posited four genres of monologic discourse based on differing global text functions: expository (which includes the traditional 'descriptive' genre as well), procedural, narrative, and hortatory (which Forster 1977 expanded into a genre called 'behavioral' and which traditional rhetoric calls 'persuasive'.) Each genre has a differing semantic orientation, which is realized in the distributions of particular lexicogrammatical features. Included in the features enumerated by Longacre 1976 are those listed in Halliday 1977 as realizing the interpersonal component of texts (the semantic component associated with tenor). Those features are: grammatical person in both the nominal and verbal groups, prepositional groups and other groups acting as disjunct adverbials, and, at the clause complex rank, mood and modality. Each of these is discussed below, along with other lexicogrammatical features which realize the interpersonal component.

2. INTERPERSONAL FUNCTIONS OF LEXICOGRAMMATICAL FEATURES

2.1. Person

We may consider the exclusive use of third person, particularly of inanimate or impersonal subjects, to represent the least interactive option of a writer for realizing the interpersonal component. Indeed, Benveniste ([1959]1971:198) called the third person 'not a "person," [but] really the verbal form whose function is to express the non-person.' Of the events in a third-person narrative, Benveniste wrote ([1959]1971:208): 'No one speaks here; the events seem to narrate themselves.' Of course this is a fiction; We must deny the possibility of an 'absolute' text, cut off from its producers and the situation of its production. Nevertheless, Benveniste's fiction is useful in heightening the contrast between purely third-person texts and those texts in which first and second person are used to acknowledge the presence of both the writer and reader. (A special case is the use of third-person references to 'the writer' or 'this writer' and 'the reader.' These involve

some acknowledgement of the presence of the participants in the text, but must be considered less interactive than the use of first and second person.)

The use of first-person forms along with third can be considered more interactive, since these forms acknowledge the presence of the writer in the text. It is important, however, to distinguish plural from singular uses of the first person. Unless there are multiple authors of a text, the use of we to refer to a single writer can either be less or more interactive than the singular pronoun. When we is used in the 'imperial' sense to create authority on the part of the writer (as in many scientific texts), it is a distancing technique, affecting greater formality in the writer-reader interaction. When, on the other hand, we is used in a sense inclusive of the reader, it can be more interactive than the singular I.

The most interactive option, however, is the inclusion of second person along with first and third. Second person is considered to be the most interactive since it explicitly acknowledges the presence of the reader of the text. Further, the use of you presupposes a writing I (while the use of I does not necessitate an explicit mention of you.)

2.2. Disjunct adverbials

Halliday 1977 includes attitudinal (disjunct) adverbials among the lexicogrammatical features realizing the interpersonal component. We might wish to expand that to include all evaluative modifiers (including adjectives) which reveal the presence of the writer through his judgments in the text. Virtually all texts contain such modifiers, even when the writer is not explicitly present in the form of first- or third-person references, as in the example below (Wald 128, emphasis added):

> (1) [Research with recombinant DNA] is all too big, and is happening too fast. So this, the central problem, remains almost unconsidered. It presents probably the largest ethical problem that science has ever had to face.

Since evaluative modifiers are present in virtually all texts, the comparative interactiveness produced by them can be measured with respect to their proportional frequency in the text.

2.3. Clause mood and modality

Direct address to the reader involves both person and mood. With respect to mood, such address frequently involves interrogative or imperative constructions, though writers may occasionally use periphrastic, indicative-mood constructions to pose questions or issue commands. Not all interrogatives are equally interactive, for often a writer will pose a question as a rhetorical device to introduce a subject, rather than as a genuine request for information from the reader. The latter requests usually presuppose a known reader, e.g. as in a personal letter, or a group of readers known to be expert in a subject.

There is also a range of interactiveness for imperatives of various forms and functions. Not all imperatives are directed toward the reader; not all imperatives which <u>are</u> so directed are realized in imperative-mood constructions. An example of such a periphrastic type of imperative is found in the following passage (Science for the People 123, emphasis added):

> (2) Self-regulation of science becomes untenable when that science begins to affect directly the lives of those who sponsor that societal luxury. Scientists <u>must come to terms</u> with the fact that they may be held accountable for the results of their work. Science <u>must shed</u> its guise of being 'for the people' when it is not directed at eliminating the causes of social problems....

The phrases 'must come to terms' and 'must shed' are periphrastic imperatives. Readers will only feel themselves to be addressed by those imperatives if they belong to the loosely-defined community of 'scientists' or if, as non- scientists, they agree with these prescriptions and seeks to have them implemented through regional or national campaigns to make scientists more socially responsible.

More directly interactive are first-person plural imperatives, in which the writer is included along with the reader under the force of the imperative, e.g. 'Let us try, with goodwill and responsibility, to work it out' (Wald 131, emphasis added) and, even more interactive, direct imperatives aimed solely at the reader, e.g. '...consider a frankly industrial development' (Wald 131, emphasis added). For these two types of imperatives (first-person plural and full second-person), two different degrees of interactiveness can be distinguished: imperatives which enlist the reader's cooperation with the writer in processing the text (e.g. Let us turn now to another issue') and imperatives which direct readers to some action or position in their extralinguistic situation (e.g. Add two cups of milk'). The latter kind of imperative is considered more interactive since such imperatives typically involve more longlasting effects (beyond the duration of text processing time) and also more trust in the authority of the writer.

2.4. Other realizations of the interpersonal component

Like first-person pronouns, deictic markers of space and time (e.g here and now) act as references to the extralinguistic situation of the writer of the text. Such references (along with others such as this place, at this time, presently, and today) are considered more interactive than 'absolute' references to the writer's extralinguistic situation, such as in Washington, D.C. or in 1981.

Another interactive function of deictic markers is their use to refer to the internal passage of time in the text--a reference to both the text's production and its reception. Consider the following sentence:

(3) Having seen why one might want to join two different sets of genes, let us now consider how it is done.

Not only does this sentence illustrate the use of the deictic now to mark the internal present of text time, but it also exemplifies the use of tense to mark the time of reading ('let us now consider') and anterior time ('Having

seen'...) in reference to text time. Spatial deixis can also be used in the same manner, as in the following example (Jackson 44, emphasis added):

> (4) If we take two single strands of bases whose sequences are complementary, such as those shown above....

It is clear that such markers refer to the text as a temporal and spatial extension, a 'thing' exchanged between writer and reader in the extralinguistic situation. (Additionally, footnotes may be counted as references to the extralinguistic situation of the text, since they are in essence meta-textual comments.)

Another feature realizing the interpersonal component is verb voice. Passive voice is inversely related to interactiveness when it is used (as it often is in scientific texts) to focus on the object of an activity and to delete any mention of agency. Of course, there is a functional explanation for this: what is important in a typical scientific report is not who did what, but what was done. Nevertheless, this construction masks the presence of the writer in the text, thereby giving the text a more 'objective' (and less interactive) quality--an important attribute for a scientific audience.

3. MEASURING THE IMPACT OF CONTEXTUAL VARIABLES ON LEXICOGRAMMATICAL FEATURES

Thusfar, we have discussed two contextual variables related to role relationships (or tenor) in the semiotic structure of situation: specialization level of intended audience and global text function (or authorial purpose). One way to compare the impact of each of these variables on text structure is to examine the distributions of the lexicogrammatical features realizing the interpersonal component in texts where both of these variables have different values, while all other contextual variables remain constant. First, however, we need to ascertain (using the same method) that each of these is a significant variable in determining text structure.

3.1. Text selection and method of analysis

For the purposes of this study, sixteen written, monologic texts were chosen from a single subject area--recombinant DNA research--to insure that neither mode nor field would affect the distribution of lexicogrammatical features. Within each text, a sample was taken of approximately 1000 words, within which the lexicogrammatical features realizing the interpersonal component were counted. The samples were chosen with regard to rhetorical organization and, wherever possible, rhetorical 'wholes'--either the entire text or a sample from one section in the body of the text--were selected.

For certain lexicogrammatical features (e.g. passive voice constructions), a proportional measure was used. For the majority of features examined, however, raw number counts were equalized for a 1000-word sample. For example, a text sample of 750 words with 2 occurrences of first-person singular pronouns would have an equalized figure of 2.7 occurrences. This equalization was necessary in order to fairly compare samples of disparate length because, in spite of the effort to choose text samples of equal length, some whole texts were less than 1000 words.

After scores for all the lexicogrammatical features were obtained, the texts were ranked on a scale of relative interactiveness based on a weighted ranking of the features themselves (cf. the earlier discussion of this in Section 2.) The primary supposition in this ranking is that features relating to the presence of the reader are more interactive than those relating to the presence of the writer. The ordering of features is displayed in Figure 1 below.

Although the features are ordered from more to less interactive along the scale, it should be stressed that no single feature will determine that a text is 'interactive.' What is important is the co-occurrence of these features in certain patterns to produce a relative degree of interactiveness.

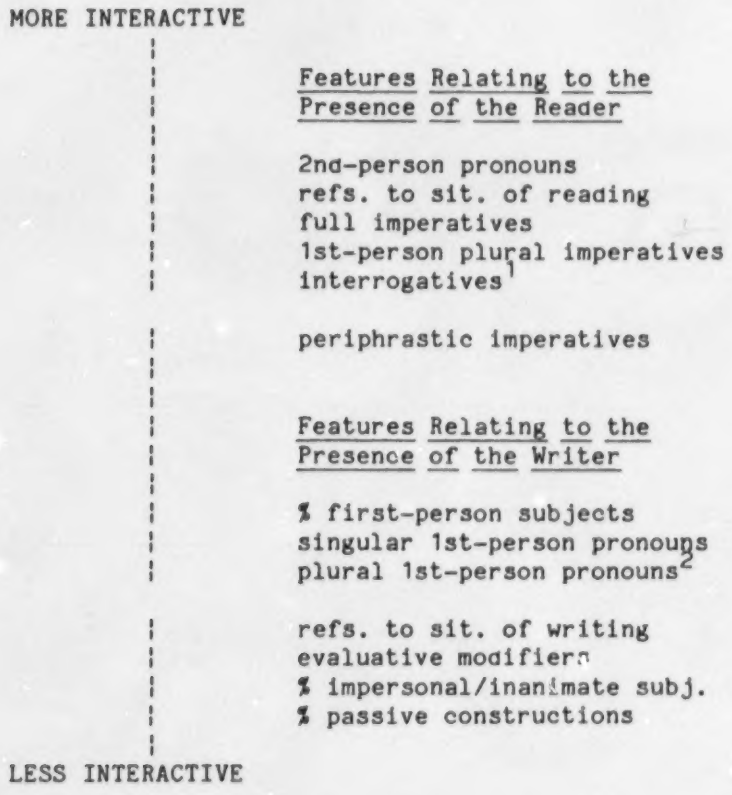

Figure 1: Lexicogrammatical Features Realizing the Interactive Component

3.2. The impact of global text function

In the tagmemic characterization of the four genres of monologic discourse based on global text function, each genre is realized through certain distributions of person and clause mood (among other features): Expository discourse has no necessary reference to any animate person and is realized

---

[1]No distinction is made here between rhetorical and non-rhetorical questions. Though this is a relevant distinction (cf. Section 2.3), no non-rhetorical questions were found in the texts examined for this paper.

[2]Although earlier in Section 2.1 we distinguished between various kinds of first-person plural references, it was not possible to maintain that distinction consistently in the text analysis since often there would be multiple meanings of *we* within the same text.

primarily in the indicative mood. Narrative discourse is usually realized through first-person or animate third-person pronouns and indicative mood. Procedural discourse may be realized through second-person pronouns and imperative-mood constructions, but need not be (e.g. as in the case of a narrated 'Procedures' section in a scientific report which can be read as either a narrative account or a set of instructions depending on the reader's purpose). Finally, behavioral discourse is usually realized through second-person pronouns and direct or periphrastic (i.e. modal) imperatives. Because of these lexicogrammatical characteristics (based on semantic functions), the four types can be ordered along a scale of interactiveness from most to least interactive in the following order: behavioral, procedural, narrative, and expository.

In order to test this ordering, representative samples containing material from the introduction, body, and conclusion were taken from four texts representing the four genres. To insure that the subject matter and intended audience of each text would be comparable, the texts were all taken from the same collection of essays on recombinant DNA research. The texts were selected according to their explicit (or implicit) global authorial purpose. Three of the texts contained explicit statements of purpose, thus enabling identification of their genre; the fourth text-- the behavioral text--lacked a clear purpose statement, but was identified as a behavioral text on the basis of its title ('The Case Against Genetic Engineering'), as well as by its inclusion in a section of the book entitled 'The Scientists' Debate: For the Opposition.'

The four text samples show distributions of lexicogrammatical features approximately as we would expect, given the relative interactiveness of their global purposes . The B sample is the most interactive , while the E sample is the least interactive. Table 1 below compares the distribution of interactive features in each text sample.

TEXTS	E	N	P	B
Number of Words	1020	950	1265	1000
PRESENCE OF THE READER				
Second-Person Pronouns.	-	-	-	-
Refs. to Sit. of Reading	2.9	3.2	3.2	5.0
Full Imperatives.	-	-	.8	3.0
1st-Person Plural Imps.	1.0	-	.8	1.0
Interrogatives.	-	6.3	-	4.0
Periphrastic Imperatives.	-	10.5	1.6	8.0
PRESENCE OF THE WRITER				
% First-Person Subjects	11	9	5	17
Singular 1st-Person Pronouns.	3.0	4.2	-	15.0
Plural 1st-Person Pronouns.	8.8	4.2	8.7	10.0
Refs. to Sit. of Writing	19.6	10.5	16.6	17.0
Evaluative Modifiers.	30.4	25.3	33.2	33.0
% Impers./Inanimate Subjs..	80	51	74	52
% Passive Constructions	25	21	13	16

Table 1: DISTRIBUTIONS OF LEXICOGRAMMATICAL FEATURES IN FOUR TEXTS WITH DIFFERENT GLOBAL FUNCTIONS

3.2.1. Presence of the reader

None of the four samples contains any second-person pronouns. We might, however, consider first-person plural pronouns (see the discussion of first-person pronouns below) to include the reader at certain points.

References to the situation of writing are also counted as references to the situation of reading when they refer to the textual product of that writing, e.g. 'In this chapter, we shall examine...' (Zander 2) or 'It should be clear from the foregoing list...' (Jackson 55). Also counted here as references to the situation of reading are direct imperatives (though these are not considered to also be references to the situation of writing.) With regard to these references, the text samples align as expected: The E sample contains the fewest such references (2.9), while the B sample contains the most (5.0). The N and P samples contain an intermediate number of references to the situation of reading (3.2 each).

Regarding mood, we note that the majority of all tensed verb forms are in the indicative mood. However, there are differences in the distributions of non-indicative constructions. The E sample is limited almost entirely to indicative occurrences , with only 1 occurrence of an imperative form, a first-person plural. The B sample is the only sample to contain occurrences of every possible category of mood (indicative, interrogative, and three kinds of imperative), thus making it the most like natural conversation in terms of the range of moods available to it. The N and P samples have intermediate numbers of occurrences of non-indicative forms, with text N containing 6.3 interrogatives and 10.5 periphrastic imperatives, and text P containing no interrogatives, but examples of all three kinds of imperatives.

In terms of direct address to the reader, only the P and B samples contain occurrences of both full and first- person plural imperatives. The P sample contains .8 occurrences of each of these; B contains 3.0 and 1.0 occurrences, respectively, of these forms. The first-person plural imperatives in the E and P samples both refer to the situation of reading, e.g. 'Having seen why one might want to join two different sets of genes, let us consider how it is done' (Jackson 43, emphasis added). It is only in the B sample that a first-person imperative exhorts the reader to extra-textual action, i.e. 'Let us try with goodwill and responsibility, to work it out' (Wald 133, emphasis added), thus making it the most interactive with respect to this feature.

Somewhat surprising is the relatively large number of periphrastic imperatives in sample N (10.5). These are rather different than the periphrastic imperatives used in the P or B samples, which refer to suggested or prescribed courses of action for a group of which the readers might consider themselves part . In the N sample, the periphrastic imperatives refer to the past-time experiences of a group of which the reader could not be considered part; these imperatives are reports of imperatives, rather than indirect inperatives.

3.2.2. Presence of the writer

In terms of first-person subjects, the texts align almost inversely of the way we might expect. Instead of showing distributions from E through B of the least to the greatest proportion of occurrences, the samples decrease in proportion of first- person subjects from E to N to P. Sample B, however, has the largest proportion of first-person subjects (17), confirming our expectations that it be most interactive.

This somewhat anomolous distribution of first-person subjects in the other three texts may be explained by considering the functions of the singular and plural first-person pronouns in each text. In text E, first-person singular pronouns are used only in the introduction (3.0 occurrences), where the writer states the content of the article and offers his opinion on the potential usefulness of recombinant DNA. In the remainder of the text, the writer uses only plural first-person pronouns. The meaning of we in text E seems to be 'our society' or 'scientists in our society' or, even more particularly, 'geneticists in our society.' Given the audience of text E--no special expertise is presupposed--the use of an ambiguously inclusive we seems intended to flatter the reader, thereby helping to persuade him of the positive value of recombinant DNA research. This underlying persuasive (behavioral) aim of text E--despite its relatively neutral expository purpose --may account for its relatively high frequency of first-person (particularly first-person plural) subjects.

In text N, singular pronouns are used (4.2 occurrences) in the body and conclusion (but not, significantly, in the introduction) to recount the writer's past-time experience as chairman of a committee set up to 'develop and recommend policies of a review process for research in recombinant DNA and related aspects of molecular genetics' (Zander 6). We in text N (4.2 occurrences) has two distinct referents--an exclusive reference (exclusive of the reader) to the members of the writer's committee and an inclusive

reference to the writer and reader in their text-time experience, as in 'In this chapter, we shall examine...' (Zander 1, emphasis added).

In text P, only plural first-person pronouns are used (8.7 occurrences). The plural pronoun has at least two meanings in this text--the inclusive use referring to writer and reader in the text and an ambiguous usage referring either to 'we geneticists' or 'genetic scientists in our society,' depending on the expertise of the reader. There is a suggestion in P that the reader might be competent in this field, a suggestion facilitated by the use of first-person plural in recounting procedures (Jackson 44, emphasis added):

> (5) If the enzyme is supplied with only one of the bases, say A, then the tails will be of the defined sequence:
>
> A-A-A-A-A-A-A-...;
>
> We can then take another molecule and add the complementary tails to it by giving the enzyme only T's to add.

References to the situation of writing show a distribution similar to that of first-person subjects: Text sample B shows a relatively large distribution, as expected, and text samples N and P show smaller distributions; however, sample E shows a larger distribution than expected. In this case, E contains the largest number of references to the situation of writing (19.6); B contains the next-largest number of such references (17.0), followed by sample P (16.6) and sample N (10.5). Again, the greater-than- expected interactiveness of sample E with respect to this feature may be due to its underlying behavioral purpose-- which would make it more interactive than an expository, narrative, or procedural text.

The 'skewed' ordering of texts in terms of their interactive features is repeated in the distribution of evaluative adjectives and adverbs. Again the N sample contains the fewest occurrences (25.3) and the E sample contains more occurrences than expected (30.4). However, in this case, the P and B samples contain the most occurrences (33.2 and 33.0, respectively) of evaluative

modifiers. If we consider only the body of each sample we find that the distribution of evaluative adjectives and adverbs becomes more what we would expect: The E sample contains the fewest occurrences (14.7); the B sample contains the most occurrences (33.0); and the N and P samples contain intermediate numbers of occurrences (26.3 and 24.1, respectively). This distribution for sample E means that slightly more than half of the evaluative modifiers in that sample occur in its introduction, where the writer attempts to be most persuasive about the benefits of DNA research.

Finally, in terms of impersonal/inanimate subjects and passive constructions--which are inversely related to interactiveness--the extreme texts align approximately as we would expect: Sample E has the largest proportion of impersonal/inanimate subjects (80%) and the largest proportion of passive constructions (25%); sample B has the second-smallest proportion of impersonal/inanimate subjects (52%) and of passive constructions (16%). The other two samples, however, show skewed distributions of these features. Sample N has the smallest proportion of impersonal/inanimate subjects (51%), but the second-largest proportion of passive constructions (21%); sample P, on the other hand, has the second-largest proportion of impersonal/inanimate subjects (74%), but the smallest proportion of passive constructions (13%).

3.2.3. Summary findings

The general distributions of interactive features confirm our ordering of the genre types on the cline of interactiveness. Considering the distributions of the features (weighted according to their order, as in Figure 1), we find that text sample E is least interactive; sample B is the most interactive, followed by samples P and N (though, as 'middle' genres, P and N are not so clearly differentiated in terms of interactiveness as the 'extreme' genres E and B.)

3.3. The impact of audience level

In order to test the difference in interactiveness caused by difference in intended audience, four expository texts were chosen from different periodicals aimed at quite different readerships. Each text was written to inform its readers about the 1980 U. S. Supreme Court decision to permit the patenting of a strain of microbacteria created by recombinant DNA techniques. However, the presumed expertise of the readers of each text varies widely. Text E4 was taken from a weekly newsmagazine aimed at the general educated public; text E3 was taken from a weekly science magazine apparently aimed at a secondary-school science level; text E2 was taken from a prestigious biweekly science periodical aimed at a relatively advanced level of science specialization; text E1 comes from a monthly review of patent law aimed at a specialized legal audience. None of the four texts were 'cover stories'; all were printed in regularly-appearing feature columns.

The lexicogrammatical features realizing interactiveness are displayed below in Table 2. The distributions of these features do not clearly characterize any one text as most interactive. Text E4 is most interactive in terms of evaluative modifiers and comparatively low proportions of impersonal/inanimate subjects and passive constructions. With respect to these features, text E1 is least interactive. However, with respect to other features associated with the presence of the reader and the writer, E1 emerges as most interactive. (In fact, it has some of the distributions characteristic of a behavioral text.) These differences in interactiveness are discussed below.

3.3.1. Presence of the reader

None of the texts contains any second-person pronouns ; only E1 contains references to the situation of reading (1.2). This reference takes the form of a periphrastic imperative imperative ('It will be recalled that...'). In terms of the modality of main and auxiliary verbs, E1 is also the most

TEXTS	E1	E2	E3	E4
Number of Words	814	740	640	1000
PRESENCE OF THE READER				
Second-Person Pronouns.	-	-	-	-
Refs. to Sit. of Reading	1.2	-	-	-
Full Imperatives.	-	-	-	-
1st-Person Plural Imps.	-	-	-	-
Interrogatives.	1.2	1.1	-	-
Periphrastic Imperatives.	3.4	-	-	-
PRESENCE OF THE WRITER				
% First-Person Subjects	0	0	0	0
Singular 1st-Person Pronouns.	-	-	-	-
Plural 1st-Person Pronouns.	-	-	-	-
Refs. to Sit. of Writing	14.7	8.1	3.1	5.0
Evaluative Modifiers.	4.9	16.2	6.2	22.0
% Impers./Inanimate Subjs..	53	52	31	45
% Passive Constructions	15	10	7	4

Table 2: DISTRIBUTIONS OF LEXICOGRAMMATICAL FEATURES IN FOUR EXPOSITORY TEXTS AIMED AT DIFFERENT AUDIENCES

interactive, containing the fewest indicative clauses (95%). E1 and E2 each contain an interrogative, and E1 also contains 3.4 periphrastic imperatives. In contrast, all of the verbs in E3 and E4 are in the indicative mood.

3.3.2. Presence of the writer

In terms of those features associated with the explicit presence of the writer and the time of writing, E1 is also the most interactive. None of the texts contains any first-person pronouns in non- quotation clauses; E1 is the only text, however, in which the writer makes any explicit reference to himself (with the third-person 'this author,' a more distant form of self-reference than first person, but still a form of self-identification). E1 also contains the most references to the time and place of writing (14.7)--nearly twice as many as the next-nearest number in E2 (8.1). The plurality of such references and of references to the presence of the reader in E1 may be explained by the fact that it is more than a simple exposition of the Supreme

Court's decision; E1 is what might be called a 'critical review,' an exposition written from an admittedly individual perspective aimed at persuading the reader of the validity of its opinion (in this case, its evaluation of the beneficial effects of the Supreme Court's decision for patent lawyers). Hence the last sentence: '...researchers in genetic modification should be encouraged to file U.S. patent applications' (Hamburg 370, emphasis added).

However, in terms of the distribution of other features associated with the presence of the writer, E1 is least interactive while E4 is most interactive. For example, in terms of evaluative adjectives and adverbs, E1 contains the fewest such modifiers (4.9), while E4 contains the most (22.0). The authors of Sentence and Clause in Scientific English found that less-specialized audiences require more explicit signalling of the relations between facts; the greater occurrence of evaluative adjectives and adverbs in E4 might be explained by the fact that E4 is directed towards the least specialized audience of all four texts. This supports the notion that the intended audience of a text is important in determining its interactiveness.

Further, with respect to the proportions of impersonal/inanimate subjects and passive constructions, E4 is generally the most interactive text. It has a lower proportion of impersonal/inanimate subjects than either E2 or E1 (45%, versus 52% and 53%, respectively) and the lowest proportion of passive constructions (4%, while E1 has the highest-- 15%). These distributions are again consonant with the findings of Sentence and Clause that the least specialized texts tended to have the smallest proportion of passive constructions, while the most specialized tended to have the largest.

3.3.3. Summary findings

With respect to certain features associated with the presence of the writer, text E4--the least specialized text--emerges as the most interactive while the most specialized text--E1--emerges as the least interactive. This finding tends to corroborate the notion that the specialization level of the intended audience is a significant variable in determining text structure. The finding that E1 is most interactive in terms of some of the features associated with the situations of the writer and the reader does not really undermine this characterization. What makes E1 more interactive is its apparent purpose to persuade its reader of a certain position. This purpose produces in E1 some of the features of a behavioral text (which, based on the results of the cross-genre comparison discussed in Section 3.2 above, would make it more interactive than any expository text).

Of course, the finding that a lower degree of audience specialization correlates with a greater degree of interactiveness may be limited by genre type. It might be the case, for example, that in procedural texts involving highly technical processes, those texts aimed at the most specialized audiences might be most interactive since that audience might be the only one able to repeat the procedures, whereas a description of the same procedures for a less specialized audience might have more of the lexicogrammatical characteristics and interactiveness of an expository text. Obviously, more study in this area using different genres is necessary.

4. THE COMPARATIVE IMPACT OF TEXT FUNCTION AND AUDIENCE LEVEL

The comparisons described in the preceding section have demonstrated the importance of global text function and audience level as contextual variables determining text structure. The cross-genre comparison in Section 3.2 demonstrated that the lexicogrammatical features which realize interactiveness tend to be distributed according to global text function; texts whose aims are to persuade or instruct their readers tend to be more interactive than texts

which aim merely to narrate or inform. The multi-audience comparison in Section 3.3 demonstrated the importance of specialization level of the intended audience in determining interactiveness; within the expository genre, texts aimed at less specialized audiences tend to be more interactive.

Having established that each of these variables is significant in affecting the distribution of the lexicogrammatical features of interactiveness, we can now compare their relative impact within a larger group of texts. Table 3 compares the distribution of lexicogrammatical features in sixteen written, monologic texts all dealing with research in recombinant DNA. The texts are ranked according to their relative interactiveness with features relating to the presence of the reader weighted more heavily than those relating to the presence of the writer. The only contextual variables which vary among the sixteen texts are global text function and specialization level of the intended audience .

Figure 2 presents the ranking of texts in a slightly different way, positioned according to genre. As can be seen, the texts generally align on the scale of interactiveness on the basis of their respective genres, with the behavioral texts grouping at the most interactive end of the scale and the expository texts grouping at the less interactive end. Level of audience seems to be a secondary determiner of interactiveness, operating <u>within</u> genres. Thus E1 is more interactive than texts E2, E3, or E4, but less interactive than almost any other narrative, procedural, and behavioral texts. Hence, it seems that we have an answer to the question posed at the beginning of this paper concerning the relative impact of contextual variables related to tenor. Global text function appears to be a primary variable determining the distribution of the lexicogrammatical features of interactiveness, while specialization level of the intended audience appears to be a secondary variable. Of course this answer must only be tentative. We need to know more about the impact of audience level on other functionally-defined genres

TEXTS	PRESENCE OF THE READER									PRESENCE OF THE WRITER			
	2ndP. Refs.	Refs. Sit. Read.	Full Imps.	1stP. Plur. Imps.	Ques.	Peri. Imps.	% 1st Pers. Subj.	Sing. 1stP.	Plur. 1stP.	Refs. Sit. Writ.	Eval. Mods.	% Im/In Subj.	% Pass.
B	-	5.0	3.0	1.0	4.0	8.0	17	15.0	10.0	17.0	33.0	52	16
P3	-	4.6	1.8	-	-	8.3	5	-	3.7	11.1	26.8	49	55
P	-	3.2	.8	.8	-	1.6	5	-	8.7	16.6	33.2	74	13
N	-	3.2	-	-	6.3	10.5	9	4.2	4.2	10.5	25.3	51	21
E	-	2.9	-	1.0	-	-	11	3.0	8.8	19.6	30.4	80	25
P4	-	3.9	-	-	-	-	0	-	-	15.5	2.6	65	74
B3	-	.9	.9	.9	9.3	3.3	34	8.3	42.6	12.0	46.3	31	6
E7	-	.8	.8	-	-	.8	19	-	16.0	8.9	17.8	75	22
P2	-	2.0	1.0	-	-	-	0	-	1.0	15.1	28.1	34	45
N1	-	-	-	-	-	3.4	30	23.7	13.8	-	35.3	48	9
E1	-	1.2	-	-	1.2	3.4	0	-	-	14.7	4.9	53	15
B1	-	-	-	-	5.4	14.1	0	-	-	8.7	28.3	64	24
N2	-	-	-	-	-	1.1	1	1.1	-	2.1	18.0	57	14
E2	-	-	-	-	1.1	-	0	-	-	8.1	16.2	52	10
E3	-	-	-	-	-	-	0	-	-	3.1	6.2	31	7
E4	-	-	-	-	-	-	0	-	-	5.0	22.0	45	4

Table 3: DISTRIBUTIONS OF LEXICOGRAMMATICAL FEATURES IN SIXTEEN SCIENTIFIC TEXTS

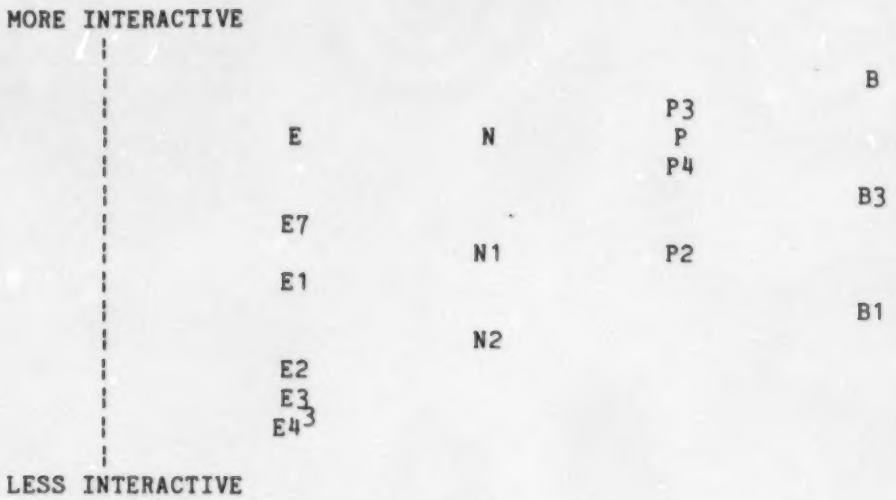

Figure 2: Ranking of Sixteen Scientific Texts According to Distributions of Lexicogrammatical Features Realizing Interactiveness

besides expository. Further, we need to test different fields and different modes to see if the impact of text function and audience level is the same as in written scientific prose. Nevertheless, the results obtained here are significant, for they show that a typology of discourse types (or registers) based on function is valid in classifying scientific texts--a finding with important theoretical and pedagogical consequences.

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[3]The apparently 'least interactive' position of text E4 seems anomolous considering our earlier characterization of it as most interactive after E1. The position of E4 here is an artefact of the mathematical weight given to lexicogrammatical features in ordering the texts. Evaluative modifiers, proportion of impersonal/inanimate subjects, and proportion of passive constructions--the features in which E4 is most interactive--were all weighted least in determining the ranking.

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